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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/688,078	10/17/2003	P. Bryant Chase	FSUN-001/01US	8210

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EXAMINER

KOSSON, ROSANNE

ART UNIT	PAPER NUMBER
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1651

DATE MAILED: 02/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/688,078

Applicant(s)

CHASE ET AL.

Examiner

Rosanne Kosson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 January 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-81 is/are pending in the application.
- 4a) Of the above claim(s) 22-68 and 74-80 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-21, 69-73 and 81 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on Oct. 17, 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 4/30/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicants' election with traverse of Group I, claims 1-21, 69-73 and 81, in the reply filed on January 19, 2005 is acknowledged.

Claims 22-68 and 74-80 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to nonelected inventions, there being no allowable generic or linking claim. Accordingly, claims 1-21, 69-73 and 81 are examined on the merits herewith.

All of Applicants' arguments regarding the restriction requirement have been considered but are not persuasive of error. Each group of claims recites a number of limitations not found in the other groups, and, as a result, the searches for the different groups are not co-extensive. Burden lies not only in the search of U.S. patents, but in the search for literature and foreign patents and in examination of the claim language and specification for compliance with the statutes concerning new matter, distinctness and scope of enablement. Consequently, examining multiple inventions creates an undue burden of search and examination. Therefore, the restriction requirement is maintained and is made final.

Claim Objections

Claim 69 is objected to because of the following informality. The claim recites "an energy-transmitting strip" and "the stripe." It is not clear whether strip or stripe or both are meant. Appropriate correction is requested.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3, 6-10, 12-14 and 81 are rejected under 35 U.S.C. 102(b) as being anticipated by Kozminski et al. (J Cell Biol 131(6):1517-1527, 1995). Kozminski discloses an actuator (molecular motor) which is responsible for intraflagellar transport (IFT) in organisms such as Chlamydomonas. The actuator comprises a rod-shaped movable member, raft-like IFT particles, that are polymeric, protein molecules. As protein molecules, they are coated with a first interactive biological material (IFT proteins). The IFT particles move substantially linearly along the length of the flagellum as a result of an internal biomolecular reaction between the first interactive biological material and a second interactive biological material. The second interactive biological

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material may be FLA10, a kinesin-like protein, whose structures transport the IFT particles toward the flagellar tip (ante-retrograde motion) or a cytoplasmic dynein, whose structures transport the IFT particles toward the flagellar base (retrograde motion). Longitudinal movement of the IFT particles by either transport mechanism is unidirectional, while the two mechanisms combined in the organelle provide bidirectional longitudinal movement. Each flagellum (*Chlamydomonas* is bi-flagellate) contains multiple units of IFT proteins, FLA10 and dynein, so that the multiple IFT proteins are transported to and from the flagellar tip (see pp. 1517, 1518 (1st paragraph), 1520 (Fig. 1), 1521 (end of 2d full paragraph), and 1526 (1st paragraph and Fig. 6). Thus, a holding of anticipation is required.

Claims 1-3, 6-10, 12-14 and 81 are rejected under 35 U.S.C. 102(e) as being anticipated by Witman et al. (US 2002/0127620). Witman also discloses an actuator (molecular motor) which is responsible for intraflagellar transport (IFT) in organisms such as *Chlamydomonas*. The actuator comprises a rod-shaped movable member, raft-like IFT particles, that are polymeric, protein molecules. As protein molecules, they are coated with a first interactive biological material (IFT proteins) (see paragraph 78). The IFT particles move substantially linearly along the length of the flagellum as a result of an internal biomolecular reaction between the first interactive biological material and a second interactive biological material. The second interactive biological material may be FLA10, a kinesin-like protein, whose structures transport the IFT particles toward the flagellar tip (ante-retrograde motion) or a cytoplasmic dynein, whose structures

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transport the IFT particles toward the flagellar base (retrograde motion). Longitudinal movement of the IFT particles by either transport mechanism is unidirectional, while the two mechanisms combined in the organelle provide bidirectional longitudinal movement. Each flagellum (*Chlamydomonas* is bi-flagellate) contains multiple units of IFT proteins, FLA10 and dynein, so that the multiple IFT proteins are transported to and from the flagellar tip (see paragraphs 82-87 and Figs. 1 and 4). Thus, a holding of anticipation is required.

Claims 69, 71 and 72 are rejected under 35 U.S.C. 102(b) as being anticipated by Schneider et al. (WO 01/09181). Schneider discloses a method of making an actuator (molecular motor) comprising movable arrays of first and second proteins, each attached to a movable member, that interact to move a driven member. The driven member may be a shaft or gear to convert the movement of the actuator into useful power that can produce work. The first and second proteins are the muscle proteins myosin and actin. The actuator also comprises a source of ATP to transmit energy to the proteins for their activation. An array of one of the proteins is coated on a first curved surface, and an array of the other protein is coated on a second, complementary curved surface, such that the two motor proteins interact to move the second surface in a predetermined direction relative to the first surface. The actuator may also comprise multiple nested layers of complementary first and second protein arrays (see p. 4, line 26, to p. 5, line 29, and p. 7, lines 4-14). The multiple sets of complementary arrays may be attached to multiple, concentric cylinders or cones, and the multiple cylinders

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placed in a housing, such that the housing containing the cylinders has a pair of opposite orifices to receive the movable members (see Fig. 7B). The housings may also be placed in series (see Fig. 9). To energize the actuator, a solution of ATP is pumped through an energy-transmitting strip to each housing (see Fig. 8). A hydrophobic region that is a seal, such as a valve or switch, is placed at each orifice connecting the ATP to the actuator to aid in retaining the ATP in the reservoir (see Fig. 9 and p. 24, lines 14-26). Thus, a holding of anticipation is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-14, 18-21, 69-73 and 81 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schneider et al. (WO 01/09181) in view of Thomas et al. (J Phys D: Appl Phys 31:253-266, 1998). The teachings of Schneider, the actuator and the method of making it, are discussed above. Schneider does not disclose an actuator in which a movable member moves substantially linearly, or in which a movable member is a rod, or wherein the longitudinal movement is bidirectional. Schneider also does not disclose a hydrophobic region in the actuator that is a collar positioned around the rod. But, the movable members in Schneider are curved (see p. 4, line 26, to p. 5, line 29) and comprise the polymer actin. They may also comprise nickel or a polymer such as poly-histidine, streptavidin, biotin or gelsolin (see p. 6, lines 22-27). The actuator is less than 100 microns in at least one dimension (see p. 16, lines 4-14).

Thomas discloses actomyosin molecular motors in which interdigitating filaments of myosin and actin slide along each other in a substantially linear direction to produce a power stroke in one direction and a recovery stroke in the opposite direction. When the myosin is fixed to a planar substrate, the actin filaments move back and forth in a complementary plane relative to the myosin filaments in the power stroke and recovery stroke (see p. 254 and p. 255, 1st paragraph and Fig. 3). The molecular motor may also be visualized as an arrangement in which rods of myosin (thick filaments) move back and forth relative to an actin surface (see p. 257, right column). As a result, one of ordinary skill in the art would have been motivated to have modified the actuator of Schneider, containing myosin- and actin-coated surfaces with relative rotary motion, with the teachings of Thomas to produce an actuator containing myosin- and actin-

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coated surfaces that move relatively linearly to each other, back and forth, because Thomas teaches that this motion is a natural one that produces a power stroke with each forward movement. The skilled artisan would have recognized that this movement in the direction of the power stroke, longitudinal movement, would have been harnessed in an actuator to move or control other parts. The artisan of ordinary skill would also have recognized that arrays of myosin and actin would have been arranged on the parts of the actuator parallel to the longitudinal axis to produce longitudinal movement. By so arranging the myosin and actin filaments, cylindrical surfaces coated with myosin and/or actin would have had rod-like shapes.

Regarding claim 73, which recites a hydrophobic region that is a collar positioned around the rod, neither Schneider nor Thomas discloses a collar around a rod that is a hydrophobic region. But, as discussed above, Thomas discloses hydrophobic regions that are seals placed at the ends of the housings and between the housings and the ATP reservoir to prevent leakage of the ATP solution from the actuator, so that it can continue to energize the actuator. In a configuration with a rod moving in a housing, one of ordinary skill in the art would have recognized that a hydrophobic seal would have been needed where the rod meets the housing to prevent leakage of ATP from the actuator.

Therefore, a holding of obviousness is required.

No claim is allowed.

The references cited above do not reasonably teach or suggest the actuator recited in claims 15-17.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rosanne Kosson whose telephone number is 571-272-2923. The examiner can normally be reached on Monday-Friday, 8:30-6:00, with alternate Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Wityshyn can be reached on 571-272-0926. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Rosanne Kosson
Examiner
Art Unit 1651

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2005-02-17



ROBERT A. WAX
PRIMARY EXAMINER
Art Unit 1653